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ABSTRACT

Students enjoy learning by doing and by manipulating objects. This paper describes classroom activities using rods with various lengths and different colors. The activities included are: (1) preparation of rods; (2) elementary addition and subtraction; (3) fractions; (4) concept of greater than, less than, and equals; (5) simple division and multiplication; (6) lesson on Roman Numerals; (7) making a bar graph; (8) pattern recognition; and (9) pattern of factorials. In each activity, the teaching method is discussed briefly. (YP)

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HANDS ON MATH USING COLORED RODS

BY

Dr. Dana Malloy Barry*

This paper was presented at a meeting of pre-service elementary math teachers. The meeting was held at SUNY Potsdam in March of 1989.

Teachers should prepare interesting lessons for their math students. They should approach the teaching of mathematics with excitement and enthusiasm. Students enjoy learning by doing and by manipulating objects. Math teachers should provide students with hands on activities and actively involve them in the learning process. Students can use colored rods to learn mathematical concepts through hands on activities.

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Teachers should have a large supply of solid, rectangular rods of various sizes and colors. Have some rods in each of five different colors and four different sizes. The rods may be purchased or made out of wood. Teachers may use wooden sticks from ice pops or strips of poster board of various lengths and colors as substitutes for the rods. Each student in the class should have a set of rods consisting of the following:

Rods 10 centimeters long and 1 centimeter wide

two red ones, two yellow ones, two blue ones, two green ones & two black ones

Rods 5 centimeters long and 1 centimeter wide

two yellow ones

Rods 3.33 centimeters long and 1 centimeter wide

three blue ones

Rods 2.5 centimeters long and 1 centimeter wide

four green ones

Teachers may devote a math lesson to the preparation of rods. This lesson would incorporate the metric system, decimals and the skill of measuring. Each student would prepare a set of rods from poster board or wooden sticks from ice pops. First the students would use a metric ruler to measure the proper length and width of each rod. Next they would color each rod on both sides. Finally they would cut the rods. (Teachers should supervise the cutting of wooden sticks). Once the sets have been prepared, the students will have objects to manipulate and aid them in the learning of math concepts.

Teachers can use the rods to teach elementary addition and subtraction. Have each student add the following: one long yellow rod (10cm), two long green rods and one long black rod. The student should have a total sum of four long rods. Now tell the students to remove the two long green rods. Ask how many long rods are left. There should be two long rods left. Other addition and subtraction examples may be used.

The use of the rods will make fractions clearer and more meaningful to the students. Have each student place one long (10 cm) yellow rod in front of him/her. Next have the students cover the long yellow rod with one yellow rod 5 cm in length. They should clearly see that the smaller rod equals $\frac{1}{2}$ of the larger one. Now have the students place the other 5 cm yellow rod next to the one that they just used. They should see that the two halves equal the whole.

$\frac{1}{2}$ (one 5 cm yellow rod) + $\frac{1}{2}$ (one 5 cm yellow rod) = 1 (one 10 cm yellow rod)

Have the students repeat the above process with the blue and green rods to show thirds and fourths of a whole.

The rods may be used to teach the concept of greater than $>$, less than $<$, and equals $=$.

Have the students compare the length of a long red rod (10 cm) to that of a long black rod. They should see that the rods are equal in length. Next have the students compare the length of a 5 cm yellow rod to the length of a 2.5 cm green rod. They should note that the yellow rod is greater in length than the green rod and that the green rod is less in length than the yellow rod. Other examples may also be shown.

The rods may be used to show simple division and multiplication. Have the students divide all of their long rods (10cm) into groups of five. Have them note the number of groups present. They should have two groups present. Have the students count all rods in both groups to come up with a total of ten rods. The students should see that two groups of five equal ten or $2x5 = 10$. Other examples may also be shown using different combinations of the rods.

Teachers may want to use the rods for a lesson on Roman Numerals or for reinforcement of text material on Roman Numerals. Students can easily form the Roman Numerals by placing the various rods next to each other on a flat surface or table top. This can be an enjoyable math drill.

The rods may be used to make a bar graph of the class. Put the names of four colors (blue, red, green, and black) on the blackboard or tape colored sheets of paper to a poster board. Have each student in the class come up to the blackboard or poster board and place a long rod under his/her favorite color. (The rods should be placed on top of each other). The result will be a bar graph showing the favorite color of the class.

The rods may also be used in the teaching of pattern recognition. For this activity the students will need five long rods (10cm), each of a different color. To start have each student place one yellow rod and one blue rod in a vertical position flat on the desk. Ask how many different ways the rods can be placed side to side in terms of color combinations. They should have two ways.

YELLOW ROD

BLUE ROD

BLUE ROD

YELLOW ROD

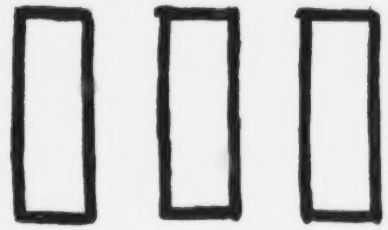
Next have each student place one yellow rod, one blue rod and one green rod next to each other on the desk. Ask how many different ways the rods can be placed side to side in terms of color combinations. They should have six. See Figure 2. You may want to have the students repeat the above process with four and then five different colored rods.

Hopefully the students will discover the pattern of factorials. When four different colored rods are used, twenty-four color combinations exist. It is four factorial (4!). This means 4X3X2X1 or 24. When five different colored rods are used, one hundred and twenty color combinations exist. It is five factorial (5!). This means 5X4X3X2X1 or 120.

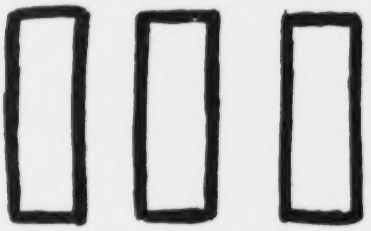
In conclusion it can be said that many math concepts could be taught by using colored rods. The rods provide hands on learning experiences for each student in the class. The students not only actively participate in the lessons, but they also see concrete examples of math concepts.

Figure 2

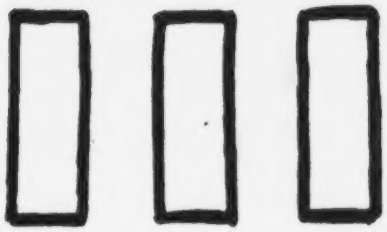
Color Combinations for Three Different Colored Rods



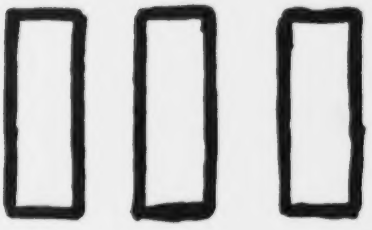
YELLOW GREEN BLUE



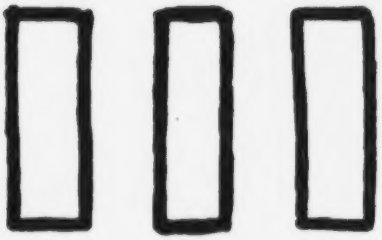
YELLOW BLUE GREEN



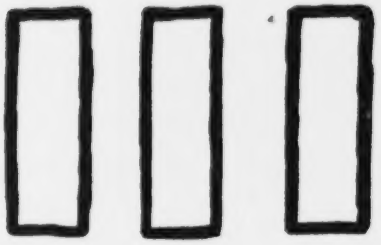
BLUE YELLOW GREEN



GREEN YELLOW BLUE



BLUE GREEN YELLOW



GREEN BLUE YELLOW